NEW SYNONYMY AND STATUS CHANGES IN THE GENUS *PLEOCOMA* LECONTE (COLEOPTERA: SCARABAEIDAE)

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Abstract

The status of *Pleocoma staff* Schaufuss is clarified, with *P. ulkei* Horn reduced to synonymy. The replacement names *P. edwardsii* LeConte and *P. adjuvans* Crotch are suppressed as nom. nov. pro *staff*. *Pleocoma remota* Davis is synonymized with *P. oregonensis* Leach, and the putative Utah localities for the genus are invalidated. *P. badia* Fall is expanded to include *P. hirsuta* Davis as a subspecies; *P. venturae* Linsley and *P. nitida* Linsley are placed in synonymy with *P. badia hirsuta*. Phenotypic variation and intergradation are discussed for each population. *P. lucia* Linsley is placed as a subspecies of *P. conjungens* Horn, and known biological information is summarized.

The scarabaeid genus *Pleocoma* LeConte, as currently recognized in the literature, includes 33 described species and 3 additional subspecies. Because of the relative rarity of specimens in collections, many of these forms were originally characterized from but one or a very few specimens, which generally precluded assessment of character variation and useful speculation on evolutionary relationships. Modern collecting methods, particularly the use of ultraviolet light, have greatly facilitated acquisition of series of male specimens. Most samples which were thought to represent geographically isolated entities have subsequently proven to be phenotype variants in widely distributed, somewhat polytypic populations. Increased knowledge of distribution and patterns of intrapopulational phenotypic variation has made possible a reassessment of taxonomic relationships in several species.

The status changes and synonymy proposed herein reflect the relationships of some of the more extensively sampled populations. These changes are presented prior to an anticipated comprehensive treatment of the genus in order to facilitate identification and incorporation of future discoveries.

Pleocoma staff Schaufuss

Pleocoma staff Schaufuss 1870:52; Rye 1874:283; Sharp 1875:206-207; Rye 1875:319; Horn 1888a:235; Horn 1888b:9, pl. 1, fig. 12; Ohaus 1909:430, t. 5; Davis 1935:31; Linsley 1938a:51-52; Linsley 1938b:99, 103.

Pleocoma adjuvans Crotch 1873:58 (nom. nov. pro *staff* Schaufuss); Sharp 1875:206-207; Rye 1875:319.

Pleocoma edwardsii LeConte 1874:83 (nom. nov. pro *staff* Schaufuss); Davis 1935:33, pl. 1, fig. 13; Linsley 1938a:50-51; Linsley 1938b:99, 101; Linsley 1941:150; Linsley 1957:102.

Pleocoma staffa Sharp 1875:207 (emend. pro *staff* Schaufuss); Rye 1875:319.

Pleocoma ulkei Horn 1888a:234; Horn 1888b:9, pl. 1, fig. 11; Leach 1933:184; Davis 1935:34, pl. 1, fig. 8; Linsley 1938a:50-51; Linsley 1938b:100-104. **New Synonymy.**

As evident from the references cited above, considerable confusion has arisen with regard to the nomenclature and more recently (Davis 1935) the true identity of this species. Crotch (1873) proposed *P. adjuvans* as a replacement name for the offensive name "*staff*" Schaufuss, but the name was not accepted by LeConte (1874) because it was proposed in a checklist. Consequently, he proposed *P. edwardsii* as a replacement name for *P. staff,* which he considered scientifically inadmissible due to its tactless political etymology. LeConte made it clear that he was not describing a new taxon, but rather redescribing one which, by his own admission, had been adequately and recognizably characterized by Schaufuss. He did, however, select a holotype for his replacement name (*P. edwardsii*) other than the original Schaufuss type. Subsequent authors (Sharp 1875; Horn 1888a & 1888b; Ohaus 1909), recognizing the impropriety of LeConte's action, continued to use the name *P. staff.* Davis (1935), in his revision of the genus, gave full species status to both *P. staff* and *P. edwardsii,* his differentiation based primarily upon the supposedly densely pubescent scutellum of *P. staff* (as opposed to the nearly glabrous scutellum of *P. edwardsii*). The holotype of *P. staff* was not available to Davis except by indirect comparison, and he therefore relied upon an incorrect translation of Schaufuss' remarks regarding this character. Although Davis did describe the scutellum of *P. staff* as being "very sparsely hairy" (based upon notes sent to him regarding the holotype), he added, "This hair has undoubtedly been rubbed off, since Schaufuss specifically mentions that the scutellum is hairy." In the discussion following the original description of *P. staff,* Schaufuss states (in translation): "The anterior half of the scutellum is covered with dense long yellow hairs; the central and posterior parts have lightly impressed, scattered punctures." The "anterior half" to which Schaufuss alluded was undoubtedly the visible portion of the mesonotal surface, which is densely punctate-pubescent in all species of *Pleocoma.* The pubescence of the holotype is very matted, but the scutellum is not at all obscured and is in fact glabrous and nearly impunctate. In general aspect the holotype is essentially identical to specimens at hand from Grass Valley and North San Juan, both in Nevada County. Among the 277 male specimens of *P. staff* examined during this study, the scutellum varies from glabrous and impunctate to lightly punctate-pubescent medially.

Horn (1888a & 1888b) originally characterized *P. ulkei* from a unique male labelled "Utah." He distinguished it from the LeConte type of *P. edwardsii* (= *P. staff* Schaufuss) by the relative shape of the posterior pronotal angles and the slightly differing lengths of the fourth antennal segments. These characters are randomly variable throughout the material examined and cannot be used to distinguish populations. Davis (1935) considered *P. ulkei* to be a species distinct from *P. staff,* although he stated that he could scarcely separate it from *P. edwardsii,* adding, "I am inclined to regard them as identical, but in view of the fact that the type of *edwardsii* lacks the terminal joints of the antennae a positive statement to that effect would be inadvisable." The characters enumerated by Davis as separating *P. ulkei* from *P. edwardsii* are similar to those given by Horn and are neither species diagnostic nor statistically valid. The holotype of *P. ulkei* most closely resembles specimens in my series from Nevada City, Nevada County, and may well have been collected somewhere in that general area.

Type Localities: *P. staff,* "California mer"; *P. edwardsii,* not given by LeConte ("California" fide Horn, 1888b); *P. ulkei,* "Utah".

Material Examined: 277 males, 47 females; CALIFORNIA: *Shasta County*: Redding; *Yuba County*: Brownsville; *Butte County*: DeSabla, Chico, Forest Ranch, Paradise; *Nevada County*: Nevada City, North San Juan, Grass Valley (Fig. 1).

Types Examined: *P. staff, P. edwardsii, P. ulkei.*

Pleocoma oregonensis Leach

Pleocoma oregonensis Leach 1933:186; Davis 1935:17; Linsley 1938b:99, 102; Ellertson 1954:938; Ellertson 1955:13-15; Ellertson 1956:431; Ellertson 1958:98; Ellertson & Ritcher 1959:1-42; Ellertson 1964:171-173; Fellin & Ritcher 1967: 251-263; Hatch 1971:437.

Pleocoma remota Davis 1934a:23; Davis 1935:8, pl. 1, fig. 9; Linsley 1938b:100, 102; Smith 1886:33 (as *Pleocoma behrensi* LeConte). **New Synonymy.**

Although the respective type specimens of *P. oregonensis* and *P. remota* were collected many years prior to being described, the dates of publication for the names are only a few weeks apart. *Pleocoma oregonensis* has priority, which is fortunate as the species has been so recorded in numerous publications. It is thus far known only from north-central Oregon (Jefferson, Wasco and Sherman counties). The holotype of *P. remota* is identical in all important respects with the type of *P. oregonensis.* Davis (1935) had not seen specimens of *P. oregonensis,* and he attempted to differentiate it from *P. remota* solely by the comparative lengths of the third antennal segment. The second couplet of Davis' key separates *P. remota* from all other "4-jointed" species by having the third segment "more than three-fourths as long as first," whereas *P. oregonensis* is grouped with species having the third segment "three-fourths or less than three-fourths as long as first." However, Davis' original and subsequent revisional descriptions of *P. remota* cite the third antennal segment as "seven-tenths as long as first joint," which is of course, less, not more, than three-fourths. Regardless of this simple error, it is now clear that relative proportions of *Pleocoma* antennal segments are often subject to considerable variation and can rarely be utilized as species-diagnostic characters. In the large series of *P. oregonensis* examined, the length of the third antennal segment varies from less than 1/2 to more than 3/4 as long as the scape.

The newly established synonymies of *P. remota* with *P. oregonensis* and *P. ulkei* with *P. staff* eliminate the putative Utah localities which have unnecessarily complicated attempts to explain distributional and evolutionary patterns in the genus.

Type Localities: *P. oregonensis,* Wasco, Oregon; *P. remota,* "Utah".

Material Examined: 267 males, 35 females; OREGON: *Jefferson, Wasco* and *Sherman Counties,* numerous localities.

Types Examined: *P. remota, P. oregonensis.*

Pleocoma badia Fall

Pleocoma badia Fall as herein redefined is a complex of closely related geographical segregates, differing by male elytral coloration and relative antennal or pronotal character states. Individual patterns of character variation occur within each sample, and although some specimens appear to be quite distinctive, they invariably represent intrapopulational phenotype extremes. Additionally, character variation within a sample is frequently transitional with other comparable samples, leading to areas of phenotypic intergradation or polytypy. Material at hand suggests a conservative, single-species treatment of the population segregates previously named *P. badia* Fall, *P. hirsuta* Davis, *P. venturae* Linsley, and *P. nitida* Linsley.

Pleocoma badia badia Fall, **New Status**

Pleocoma badia Fall 1917:15; Davis 1916:11-12 (habit note prior to original description); Davis 1918:116-118; Davis 1924:48; Davis 1935:26, pl. 1, figs. 1, 17; Linsley 1945:112.

Males of *P. badia badia* Fall are remarkably constant in the relatively large amount of material now available for study. Elytral coloration is uniformly light reddish-brown, while pronotal coloration ranges from reddish-brown to piceous. Pronotal pubescence and associated coarse punctation are confined to the antemedian impression, which is usually narrower than the head. Antennal segment 3 is simple, elongate, and subcylindrical; segment 4 is transverse, angulated anteriorly or with a short lamella; segment 5 has a lamella from 2/3 to 4/5 as long as segment 6.

A recently discovered population of *P. badia,* extending along a ridgetop between Bear Divide and Newhall in Los Angeles County, represents a phenotypic cline between the nominotypical *P. badia* and *P. hirsuta.* Random samples of equal number were collected from two areas along an east-west transect, and males in each sample were arranged according to elytral coloration, from lightest to darkest. In the first sample, taken from 3 to 4 miles west of Bear Divide, 36% are within the narrow normal color range of typical *P. badia,* 24% within the normal color range of *P. hirsuta* and the remainder comprise a remarkably even gradient between the two. In the second sample, collected between 6.1 and 9.7 miles west of Bear Divide, only 8% are as light-colored as typical male *P. badia,* while 40% are within the range of "*hirsuta*;;. Most of the sample display a colorational continuum from rich reddish-brown to very dark chestnut-brown. Pronotal coloration is predominantly reddish in both samples, although piceous pronota may be found with all combinations of elytral coloration. The color of the body pubescence, normally a rather constant feature in the genus, ranges from golden to dull reddish-brown or light chocolate-brown. Golden is predominant, particularly among the paler specimens, with reddish or brown combining at random with integumental color, creating a mosaic of phenotypes. Structurally, these samples are within the normal ranges of *P. badia badia,* except that the antemedian pronotal impression is frequently more broadly convex.

Whether these samples actually represent an area of secondary subspecies contact between *P. badia badia* and *P. badia hirsuta* can only be established by further collection. Suitable localities east of Bear Divide should be surveyed to determine the distributional range of the nominate phenotype. It is possible that typical *P. hirsuta,* which is now known to be widespread and abundant throughout the foothills of the western San Gabriel Mountains, has only recently become established at the higher altitudes of the sample localities, and that phenotype instability is responsive to different environmental pressures. Reddish male populations of *P. badia* occur at considerably higher elevations than do the piceous populations, which suggests that there may be selection for a paler integument at higher altitudes. Significant vertical movement by any population of *Pleocoma* might well result in gradual chromatic changes, although in most insects, when movement is toward higher elevations, the changes would be expressed in melanism rather than albinism.

Pleocoma badia hirsuta Davis, **New Status**

Pleocoma conjugens var. *hirsutus* Davis 1934b:88-89; Davis 1935:29.
Pleocoma hirsuta, Linsley 1941:146-147; Ritcher & Baker 1974:480-494 (morphology).
Pleocoma nitida Linsley 1941:147-148; Hazeltine 1952:202; Hovore 1971:200-201. **New Synonymy.**
Pleocoma venturae Linsley 1945:110-111; Hovore 1971:200. **New Synonymy.**

Pleocoma badia hirsuta Davis (including population segregates previously named as *P. venturae* and *P. nitida*) differs from the nominotypical subspecies most consistently by the piceous coloration of the male elytra. Although some population samples have character tendencies which, at their extremes, appear to differ qualitatively, most of the structural characters have proven to be transitional between geographic segregates.

Within samples of "typical" *P. b. hirsuta* (from Newhall, 7 mi S Sandberg, Tujunga, La Crescenta, Glendale) most characters exhibit independent patterns of variation. The holotype of *P. b. hirsuta* is somewhat smaller and hairier than the norm, a condition represented by about 5% of any sample. Pronotal coloration ranges from entirely pale reddish to wholly piceous; the antemedian impression varies from feebly indicated to broadly convex; the coarseness of pronotal punctation and the pubescence are interrelated structures, varying from nearly absent to covering the entire discal surface. The relative pronotal dimensions and the extent of the basal angulation exhibit a broad spectrum of variation, with a tendency toward allometry. The greatest relative pronotal width is usually expressed in the largest individuals. Antennal ratios are essentially identical to those found in *P. b. badia.*

Material examined from the Santa Monica Mountains is very close phenotypically to samples from near the type locality, but with a characteristic tendency toward more robust, less pubescent pronota.

P. venturae was originally differentiated from *P. badia, P. hirsuta,* and *P. nitida* by the lack of coarse pronotal punctation-pubescence. In the 45 males examined (including the holotype and 27 paratypes), well over 1/3 have the antemedian impressions with significant numbers of larger, pubescence-bearing punctures. There is a tendency for slight reduction of the antennal formula, with occasional specimens having the lamella of segment 5 only 1/3 as long as that of segment 6. These tendencies are statistically insignificant, and are transitional between segregates. *P. venturae* is therefore considered a synonym of *P. badia hirsuta.*

Males of the *P. nitida* segregate exhibit the greatest number of characters extremes thus far seen in this subspecies. The pronotal median impression is usually very broadly convex, with coarse punctation-pubescence frequently distributed over the entire discal surface. The more shining integument, glabrous scutellum, sparsely hairy and broad pronotum of the holotype are inconsistent characters within the samples at hand, and generally are convergent with their counterparts in other geographical segregates. Antennal segment 4 is transverse, with a short projection or lamella up to 1/3 as long as that of segment 5, and segment 5 has a lamella from 2/3 to 4/5 as long as that of segment 6. Pronotal dimensions fall within the same basic numerical sets as those of "typical" *P. b. hirsuta,* measuring from scarcely more than twice as wide as long to nearly 2½ times as wide as long.

Material collected 6 miles NE of Santa Margarita, San Luis Obispo County, in 1970 and 1973 suggests that a certain amount of allochronic variation may occur among various generations. Specimens from 1973 have the dorsal integument more opaque, the elytra minutely alutaceous, and the antennal formulae confined to the lower values of the 1970 sample.

Females of *P. b. badia* and *P. b. hirsuta* cannot be differentiated constantly in series. The lone female examined of *P. nitida* is smaller than those of other segregates, has the pronotum barely wider than long (as opposed to distinctly wider than long in *P. b. badia* and "typical" *P. b. hirsuta*), and has the antemedian pronotal surface finely pubescent. If these differences prove constant in series, *P. nitida* may possibly represent a subspecies. In view of the extreme variability of the male phenotype in this subspecies, and the high percentage of character convergence between geographical segregates, it seems appropriate to regard *P. nitida,* along with *P. venturae,* as a synonym of *P. badia hirsuta.*

Type Localities: *P. badia,* Mt. Wilson, Los Angeles County; *P. hirsuta,* "between Lebec and Saugus, in Los Angeles County, California, in the Sierra Madre Mountains" (label data actually reads: "Ridge Route . . . 7 miles this side of the summit"); *P. venturae,* Squaw Flat, Sespe Canyon, Ventura County; *P. nitida,* (holotype) 1 mile S Atascadero, San Luis Obispo County, (allotype) 6 miles E Santa Margarita, San Luis Obispo County.

Material Examined: *P. b. badia*: 235 males, 95 females; CALIFORNIA: *Los Angeles County*: Mt. Wilson, Strawberry Peak, 3-4 miles W and 6.1-9.7 miles W Bear Divide; *b. hirsuta*: 211 males, 18 females; CALIFORNIA: *Los Angeles County*: Ridge Route, 7 miles S Sandberg, Newhall and vicinity, Placerita Canyon, Tujunga, La Crescenta, Glendale, and various localities throughout the western San Gabriel Mountains and the Santa Monica Mountains; *Ventura County*: Squaw Flat, 5 miles S Squaw Flat, Tar Creek (*venturae*); *Santa Barbara County*: "Santa Barbara" (1 female); *San Luis Obispo County*: 6 miles NE Santa Margarita (*nitida*) (Fig. 1).

Types Examined: *P. hirsuta, P. venturae, P. nitida.*

Pleocoma conjungens Horn

This species, as herein redefined, consists of two apparently allopatric population groups, occurring in the coastal mountain ranges of Santa Cruz and Monterey Counties, California.

Within the material examined from both populations, characters such as the shape of the ocular canthi, the relative proportions of the intermediate antennal segments and the dorsal outline of the pronotum express remarkably similar patterns of variability; population differentiation is therefore based primarily upon quantitative but consistent antennal characters. There is also a considerable difference in overall size between females of the two segregates, and available biological information seems to indicate a difference in larval food preferences.

The antennomeres of the two known population groups do not appear to be transitional, and, in the absence of geographically or phenotypically intermediate material, it seems best to consider them as representing two discrete subspecies.

Pleocoma conjungens conjungens Horn, **New Status**

Pleocoma conjugens Horn 1888a:234; Horn 1888b:7, pl. 1, fig. 10; Davis 1935:28, pl. 1, fig. 10; Linsley 1938a:54-55; Linsley 1938b:100, 101; Linsley 1941:145; Hazeltine 1950:188-189.

Males of *Pleocoma c. conjungens* exhibit considerable variation in the relative development of the intermediate antennal segments. Segment 3 is elongate, strongly angulated anteriorly at apical 1/3; segment 4 is usually transverse, angulated anteriorly or with a short projection (rarely simple); segment 5 has a lamella from slightly less than 1/3 to about 2/3 as long as that of segment 6. The holotype has the lamella of the antennal segment 5 somewhat more than 2/3 as long as that of segment 6, and it is possible that the holotype specimen represents a phenotypic sample slightly different from the material examined during this study. Horn (1888a, 1888b) recorded the type locality as "near Santa Cruz City, California," and *P. c. conjungens* is known to be widespread throughout the mountains surrounding the city of Santa Cruz. There is a tendency within the genus for species with high percentages of individual character variation within samples to coincidentally exhibit considerable interpopulational variation in the same characters. In any event, it is not possible to determine whether a single anomalous specimen actually represents a different locality sample or is merely an individual variant.

Females of *P. c. conjungens* are relatively small (Length: 27-32 mm), have the pronotal surface shining and only moderately densely punctate. Antennal segment 3 is short and subcylindrical or gradually expanded apically, segment 4 simple or feebly angulated anteriorly, segment 5 with a short lamella, segment 6 with a lamella distinctly shorter than that of segment 7, segment 9 distinctly longest.

Hazeltine (1950) records the probable host plants of *P. c. conjungens* as *Pinus ponderosa* Dougl., *Gnaphalium* sp., and *Quercus agrifolia* Nee, with larvae having been taken in an area of "grass and yellow pine roots."

Pleocoma conjungens lucia Linsley, **New Status**

Pleocoma lucia Linsley 1941:145-146.

Males of this subspecies, which is thus far known only from a small section of the Santa Lucia Mountains, differ from nominotypical specimens primarily by the reduced antennal formula, briefly characterized as follows: segment 3 subcylindrical, simple or very slightly angulated anteriorly, segment 4 simple or angulated anteriorly, segment 5 strongly transverse with acute process or short lamella, lamella of segment 6 from slightly more than 1/2 to about 4/5 as long as that of segment 7. Pronotal characters, such as the relative width of disc, shape of the posterior angles, and sculpturation of the lateral discal impressions intergrade evenly between the two subspecies and are therefore of little diagnostic value.

Females of *P. c. lucia* differ from specimens examined from Santa Cruz County by the much larger overall size (Length: 36.5-42 mm) and reduced antennal formula. Segment 3 is short and subcylindrical or subconical, segment 4 feebly angulated anteriorly, segment 5 transversely angulated anteriorly, segment 6 with acute process or short lamella, segment 7 with lamella about 3/4 as long as that of segment 8, segment 9 distinctly longest. Females of both subspecies have the pronotal disc very shiny and less coarsely, densely punctate than most other *Pleocoma* species.

I have collected larvae, pupae, and adults of this subspecies from cells in rocky clay soil, at depths ranging from about 36 cm to several meters below the soil surface. The larvae were found adjacent to small (6-10 mm diameter) rootlets of a young oak tree (trunk diameter approx. 20 cm) which appeared to be a slightly aberrant *Quercus agrifolia*. The sticky clay soil was thoroughly saturated from several days of heavy rainfall, and due to the constantly flowing mud, I was unable to observe actual larval feeding.

Type Localities: *P. conjungens,* "near Santa Cruz City, California"; *P. lucia,* (holotype) Frances Simes Hastings Natural History Reservation, near Jamesburg, Santa Lucia Mountains, Monterey County, California, (allotype) "collected near Jamesburg."

Material Examined: *P. c. conjungens*: 293 males, 15 females; CALIFORNIA: *Santa Cruz County*: Santa Cruz, Ben Lomond, Felton, Mt. Hermon, Scotts Valley, Redwood Glen, Waddell Creek; *P. c. lucia*: 74 males, 9 females; CALIFORNIA: *Monterey County*: Frances Simes Hastings Natural History Reservation, "G-16, near Jamesburg", Jamesburg, 7.3 mi N Tassajara Hot Springs on Greenfield Road, "Fish pond, Anastasia Canyon, 2 mi NW summit." (Fig. 1)

Types Examined: *P. conjugens, P. lucia.*

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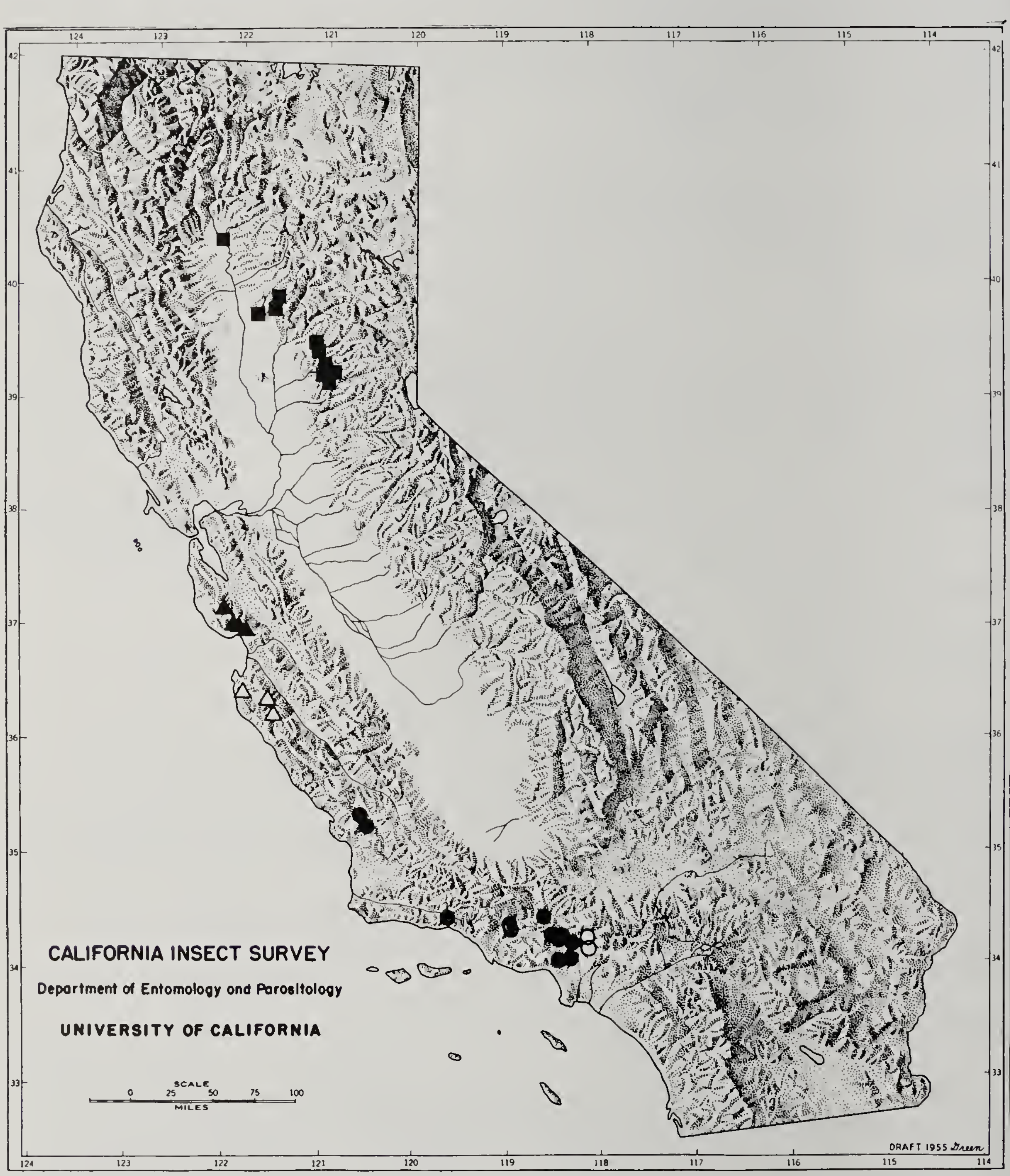

Fig. 1. Distributional map of *Pleocoma* species: *P. staff* (shaded squares); *P. c. conjungens* (shaded triangles); *P. c. lucia* (open triangles); *P. b. badia* (open circles); *P. b. hirsuta* (shaded circles).